

Qualifying Exam Syllabus

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committee:

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Major Topic: **Operator Algebras** (*Modern Analysis*)

Continuous functional calculus, Spectral theorem (functional calculus version), Gelfand transform.

C* algebras: adjoining an identity, commutative C* algebras, approximate identities, ideals and quotients, states, pure states, the GNS construction, Gelfand-Naimark theorem.

von Neumann algebras: bicommutant theorem, Kaplansky density theorem, examples of factors, comparison of projections in factors, definition of types I, II, and III, the coupling constant.

Major Topic: **Complex Analysis** (*Classical Analysis*)

Analytic functions, Cauchy-Riemann equations, Cauchy's theorem and the Cauchy integral formula, power series, Laurent series, Liouville theorem and the fundamental theorem of algebra, open mapping theorem, maximum principle, Schwartz's lemma, Weierstrass-Casorati theorem, Residue theorem, the argument principle, Rouché's theorem, the Riemann mapping theorem.

Minor Topic: **Representation Theory of Finite Groups** (*Algebra*)

Schur's lemma, complete reducibility in characteristic zero, characters, orthogonality relations, character tables, induction of representations, Frobenius reciprocity, representations of symmetric groups.